EXHIBIT B – Technical Report

FCC ID O7O-UPP

Measurement/Technical Report

Diamond Traffic Products

Phoenix Vehicle Classifier

FCC ID: O7O-UPP

August 22, 2000

This report concerns (check one):	Original Grant__*X*__ *Class II Change*____
Equipment Type: Part 15, Low Power Transmitter below 1.705 MHz	Rule Part: 47 CFR 15.201
Deferred grant requested per 47 CFR 0.457 (d)(1)(ii)?	Yes_____ no__X__
If yes, defer until:	_____N/A_____ Date
Diamond Traffic Products agrees to notify the Commission by:	_____N/A_____ Date
of the intended date of announcement of the product so that the grant can be issued on that date.	
Transition Rules Request per 15.37:	yes_____ no__X__
If no, assumed Part 15, Subpart C for intentional radiators – new 47 CFR [10-1-92] provision.	
Report prepared by:	Northwest EMC, Inc. 22975 NW Evergreen Pkwy. Ste 400 Hillsboro, OR 97124 (503) 844-4066 Fax: (503) 844-3826

Report No. HIGH0002

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1.0 General Information

1.1 Product Description

Manufactured By.....Diamond Traffic Products

Address..... PO Box 1455 Oakridge, OR 97463

Test Requested By: .....Guy Gibson

Model.....Phoenix Vehicle Classifier

FCC ID.....O7O-UPP

Serial Number(s) 50090

Date of Test..... August 4, 2000 through August 22, 2000

Job Number.....HIGH0002

Prepared By:

Vicki Albertson

Vicki Albertson, Technical Report and Documentation Manager

Technical Review By:

Greg Kiemel, Director of Engineering

Approved By:

Dean Ghizzone, President

1.1 Product Description - continued

The EUT is a 29 to 88 kHz transmitter seeking authorization under 47 CFR 15.201. The EUT is contained on a loop sensor board that is a subassembly to the Phoenix Vehicle Classifier unit. The Phoenix is a road-way traffic counter that makes use of inductive loop sensor antennas installed in the surface of roads and highways. The EUT is designed to be connected to these antennas and monitor traffic events. Government agencies responsible for operation of traffic signals and collection of traffic data are the users of the Phoenix. Speed, length, and number of axels are typical of the data which can be recorded and later retrieved.

The Phoenix Vechicle Classifier consists of several circuit boards that include the microprocessor, backup battery, charger network, memory, and the loop sensor board (EUT). Ports include a DC input, serial interface (for data retrieval via a PC or smart modem), and loop inputs (for connection of the inductive loop sensor antennas).

The Phoenix Vehicle Classifier is housed in one of three aluminum enclosures: UPP Large Formed Box, UPP Small Formed Box, and the UPP Cast Box. The EUT was tested in all three enclosures.

Users (government agencies) install the inductive loop sensor antennas in the road surface. The typical traffic counting loop will use 14 to 18 gauge, 8 to 80 strand wire in loops ranging from 4ft x 4ft to 8ft. x 8ft., with lead-in wire ranging from 25ft to 600ft long. The EUT was tested with three different loop sizes, 4ft. x.4ft., 6ft. x 6ft., and 8ft. x 8ft.

The Phoenix Vehicle Classifier has also been tested and found compliant with FCC Part 15 Subpart B rules as a Class B computer peripheral*.

**** A copy of the DoC certificate may be referenced in Exhibit "R", file name"DoC Certificate.pdf"***

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1.2 Related Submittals/Grants

None

1.3 Tested System Details

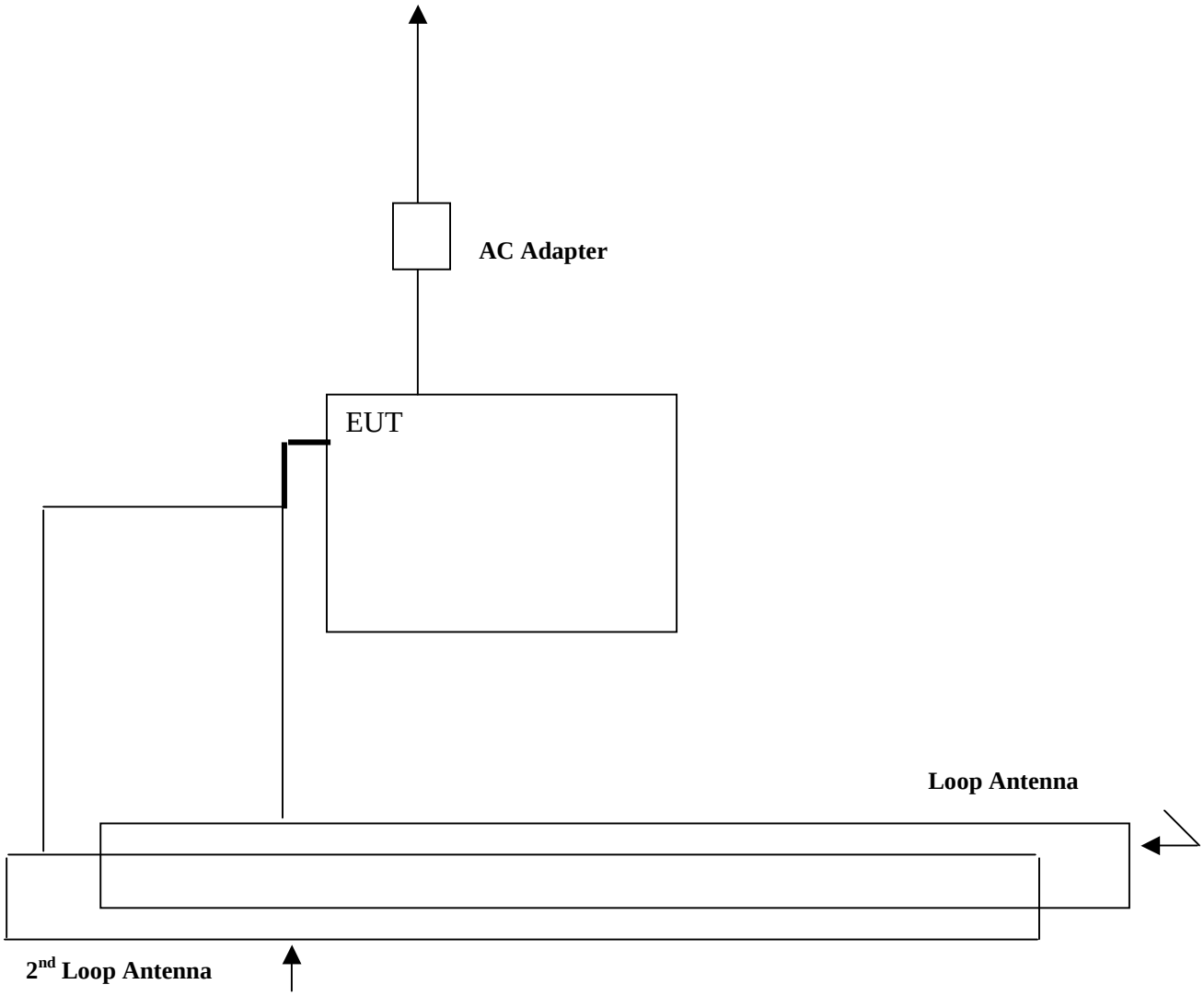
EUT and Peripherals

Item	FCC ID	Description and Serial No.
EUT	O7O-UPP	Phoenix Vehicle Classifier, Serial No. 50090
AC Adapter	N/A	CUI Stack Model 48-12-1000D
Loop Antennas	N/A	4' x 4', 6' x 6', 8' x 8'

Cables

Cable Type	Shield	Length (meters)	Ferrite	Connector	Connection Point 1	Connection Point 2
RS 232	Yes	1.2	Yes	Plastic	EUT	PC
DC Cable	No	1.8	No	Plastic	EUT	AC Adapter
Loop Harness	No	2.0	No	Plastic	EUT	Loop Antennas

Figure 1: Configuration of Tested System



1.4 Test Methodology

Radiated testing was performed according to the procedures in ANSI C63.4 (1992).. Radiated testing was performed at an antenna to EUT distance of 3 meters, from 9 kHz to 1 GHz. However, instead of a rod antenna as specified by ANSI, a loop antenna was used.

1.5 Test Facility

The semi-anechoic chamber and conducted measurement facility used to collect the radiated and conducted data is located at

Northwest EMC, Inc.
22975 NW Evergreen Pkwy., Ste 400
Hillsboro, OR 97124
(503) 844-4066
Fax: 844-3826

The semi-anechoic chamber, and conducted measurement facility is located in Hillsboro, OR, at the address shown above. This site has been fully described in a report filed with the FCC (Federal Communications Commission), and accepted by the FCC in a letter maintained in our files.

Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Lab Code: 200059-0.

2.0 System Test Configuration

2.1 Justification

2.1.1 Operating Modes

Software and firmware provided by the manufacturer operated the EUT at its maximum data rate in a configuration that simulated typical use. Each loop antenna was energized and monitored for any change in state. This occurs every 5 msec. Only one loop is energized at time.

2.1.2 Test Configuration

Users (government agencies) install the inductive loop sensor antennas in the road surface. The typical traffic counting loop will use 14 to 18 gauge, 8 to 80 strand wire in loops ranging from 4ft x 4ft to 8ft. x 8ft., with lead-in wire ranging from 25ft to 600ft long. During a telephone conversation on August 15, 2000, Rich Fabina of the FCC provided the following interpretation to Greg Kiemel of Northwest EMC: It is the FCC's interpretation that the EUT is exempt from the antenna connection requirements of 47 CFR 15.203. However, the FCC does require the EUT be tested with a range of loop sizes. Since the exact size, number of turns, and gauge of wire is unknown for any given installation, the FCC requires the EUT to be tested with three different sizes across the possible range (smallest, medium, and largest sizes). In accordance with this interpretation, the EUT was tested with three different loop sizes, 4ft. x.4ft., 6ft. x 6ft., and 8ft. x 8ft. Final data was taken with each loop size.

Although the loop sensor board (EUT) can be configured with up to 4 inductive loop sensor antennas connected at a time, only one loop is energized at a time. The EUT was scanned with 2 to 4 antennas connected at a time. No difference was detected. Final data was taken with two loops connected at a time.

The Phoenix Vehicle Classifier is housed in one of three aluminum enclosures: UPP Large Formed Box, UPP Small Formed Box, and the UPP Cast Box. The EUT was scanned in all three enclosures. Final data was taken in the worst case enclosure, the UPP Large Formed box.

The EUT can be operated from batteries, or from an external AC adapter. The EUT was scanned in both configurations. Final data was taken in the worst case configuration utilizing the AC adapter. The adapter enables the battery charging circuitry which resulted in a higher measured noise level.

2.2 EUT Exercise Software

EUT Firmware Ver. 2.39A performed a continuous polling of loop inputs in a time-multiplex manner.

2.3 Special Accessories

None

2.4 Equipment Modifications

The following modifications were made in order to achieve EMI compliance:

- Ferrico NF-100 ferrite on serial cable at EUT end.
- Ferrico NF-130 ferrite with one turn on internal serial cable harness near receptacle.
- Ferrico NF-100 ferrite on internal power harness near daughter board with one turn.
- Schaffner P/N FN 660-1/06 line filter near DC receptacle bolted to chassis ground.
- Change loop board C9, C10 to .056*u*F. Change loop board C11, C12 to .068*u*F.

Please reference exhibit "S", file name "Equipment Modifications.pdf" for the manufacturer's attestation statement.

3.0 Antenna Requirement

During a telephone conversation on August 15, 2000, Rich Fabina of the FCC provided the following interpretation to Greg Kiemel of Northwest EMC: It is the FCC's interpretation that the EUT is exempt from the antenna connection requirements of 47 CFR 15.203.

3.1 Antenna Information

Users (government agencies) install the inductive loop sensor antennas in the road surface. The typical traffic counting loop will use 14 to 18 gauge, 8 to 80 strand wire in loops ranging from 4ft x 4ft to 8ft. x 8ft., with lead-in wire ranging from 25ft to 600ft long. The effective inductance is kept within a defined range as detailed in the Road Loop Installation Guide. Loop inductance must be between 65 to 500 uH. Oscillation frequency will range from 88 kHz for 65 uH to 29 kHz for 500 uH. Transmitted power is effectively the same throughout this range. During installation, the loop antennas are permanently soldered to the UPP loop connector by professional installers according to the loop installation guide.

Please reference exhibit "C", file name "Loop Installation Guide.pdf" for the Loop Antenna Installation Guide.

4.0 RF Exposure Compliance Requirements

The EUT meets the requirement that it be operated in a manner that ensures the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines (ref. 47 CFR 1.1307, 1.1310, 2.1091, and 2.1093. Also OET Bulletin 65, Supplement C).

The EUT will only be used in roadside installations, therefore it is considered a fixed installation. It will not be incorporated into any other device.

The following is an excerpt from FCC Public Notice DA000912:

> "It is important to note that the Commission's RF exposure rules apply to all facilities, operations and devices regulated by the Commission. While a given facility, operation or device might be categorically excluded from routine evaluation for RF exposure by Section 1.1307(b)(1) of our rules, it must still comply with the FCC's exposure guidelines."

The EUT is categorically excluded from routine evaluation for RF exposure per Section 1.1307(b)(1) due to its use, transmit frequency, and output power. Therefore, no warning labels, no RF exposure warnings in the manual, or other protection measures will be used with the EUT.

5.0 AC Powerline Conducted Emissions

Per 47 15.207(a), if the EUT is connected to the AC powerline directly, then it should be tested to demonstrate compliance with the conducted limits of 15.207.

The AC powerline conducted emissions were measured with the EUT operating in a mode typical of normal operation. The EUT was transmitting at its maximum data rate. The spectrum was scanned from 450 kHz to 30 MHz. The test setup and procedures were in accordance with ANSI C63.4-1992.

Per 47 CFR 15.207, the radio frequency voltage that is conducted back onto the AC power line from the EUT, on any frequency within the 450 kHz to 30 MHz band, does not exceed 250 microvolts.

The AC Powerline conducted emissions data may be referenced in Exhibit "E", file name "AC Powerline Conducted Emissions.pdf".

6.0 Spurious Radiated Emissions

The field strength of the spurious emissions shall meet the limits as defined in 47 CFR 15.209. Compliance with the provisions of 15.205 shall be demonstrated. The EUT was configured for continuous modulated operation. The spectrum was scanned from 9 kHz to 1 GHz.

While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and polarization, and manipulating the EUT in 3 orthogonal planes (per ANSI C63.4:1992). A magnetic loop antenna was used for measurements below 30 MHz. The loop antenna orientation was maximized in both horizontal and vertical planes.

Although the loop sensor board (EUT) can be configured with up to 4 inductive loop sensor antennas connected at a time, only one loop is energized at a time. The EUT was scanned with 2 to 4 antennas connected at a time. No difference was detected. Final data was taken with two loops connected at a time. The EUT was tested with three different loop sizes, 4ft. x.4ft., 6ft. x 6ft., and 8ft. x 8ft. Final data was taken with each loop size.

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The EUT can be operated from batteries, or from an external AC adapter. The EUT was scanned in both configurations. Final data was taken in the worst case configuration utilizing the AC adapter. The adapter enables the battery charging circuitry which resulted in a higher measured noise level.

6.1 Results

The field strength of the spurious emissions meet the limits as defined in 47 CFR 15.209. Further, spurious emissions meet the provisions of 15.205.

The final radiated data may be referenced in Exhibit "F", file name "Radiated Emissions.pdf".

7.0 Field Strength Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured level. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

where : FS = Field Strength

RA = Measured Level

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/meter.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/meter
Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

7.1 Measurement Bandwidths

Peak Data

9 kHz – 150 kHz .....1 kHz
150 kHz - 30 MHz .....10 kHz
30 MHz - 1000 MHz .....100 kHz
1000 MHz - 10000 MHz .....1000 kHz

Quasi-peak Data

9 kHz – 150 kHz ..... 200 Hz
150 kHz - 30 MHz .....9 kHz
30 MHz - 1000 MHz .....120 kHz

8.0 Measurement Equipment

Instrument	Manufacturer	Model	Serial No.	Cal Due
Spectrum Analyzer	Hewlett Packard	8591A	2943A00519	05/16/2001
LISN	Solar	9252-50-R-24-BNC	992801	07/06/2001
LISN	Solar	9252-50-R-24-BNC	971623	07/06/2001
Spectrum Analyzer	Hewlett Packard	8566B	2747A05213	01/19/2001
Quasi-Peak Adapter	Hewlett Packard	85650A	2811A01353	01/19/2001
Pre-Amplifier	AR	LN1000A	25660	09/02/2000
Loop Antenna	EMCO	6502	9303-2808	02/02/2002
Biconilog Antenna	EMCO	3141	9906-1146	12/02/2000